

## THE SPERMATHECA IN THE FLOUR BEETLE (*TRIBOLIUM CASTANEUM* HERBST)<sup>1</sup>

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The histology of the spermatheca of the Tenebrionid beetles has been very poorly studied. The structure of the spermatheca of *Tribolium castaneum* Herbst differs greatly from the Coleopteran spermathecae described by previous authors (see Snodgrass, 1935; Imms, 1934). It is characterized by being unrecognizable in gross anatomical dissection. The descriptive terms used in this paper are those employed by Snodgrass (1935).

### MATERIALS AND METHODS

Adult females of *Tribolium castaneum* Herbst were fixed in Mukerji's fluid (Mukerji, 1937; Sinha, 1953, in press) and serial sections of the entire body, 8 micra in thickness, were made in transverse and longitudinal planes. The technique employed for sectioning the sclerotized beetles was that of Mukerji with the author's modification. Some dissections of the organ were also made in normal saline solution and later sectioned by the ordinary paraffin method. Sets of the serial sections of the insects were stained in Mallory's triple stain and Delafield's Hematoxylin and Eosin, whereas the sets from the dissected organs were stained only in the latter.

### DESCRIPTION

The spermatheca of the *Tribolium castaneum* Herbst is a blunt, apical, anterior swelling of the vagina which is totally unrecognizable from outside. It is 0.08 mm. long and 0.13 mm. in diameter and is located 0.13 mm. above the junction of the fifth and the sixth abdominal sterna (third and fourth visible sterna) in natural position. A study of the serial sections reveals that the organ is a rectangular muscular chamber composed of four long

<sup>1</sup> Studies carried out in the Entomology Laboratory, Department of Zoology, University of Calcutta, India.

and convoluted pouches, extending almost throughout the organ. Of these pouches, one is unusually broad having a maximum diameter of 0.02 mm. Its position is slightly dorsal to the center of the organ. The other three pouches which are 0.01 mm. in diameter open into this relatively larger pouch immediately above the dorso-lateral margin of the vagina. The muscular wall of the vagina is broken obliquely at this point making a connection between the main cavity of the vagina and the lumen of the larger pouch. As seen in figure 1, this narrow passage which is less than 8 micra in diameter at its narrowest portion is the connection between the store of sperms and the vagina. In sections of fertilized females the pouches are observed to be packed with sperms (figure 1). The heads of the clusters of the



FIGURE 1: A longitudinal section through the posterior part of the abdomen of a female *Tribolium castaneum* Herbst showing vagina, spermatheca, and the accessory gland in natural position; a. spermatheca, b. mass of sperms in the vagina, and c. accessory gland.

sperms are directed toward the blind ends of the pouches. As the sperms are extremely minute, it was difficult to be certain of their presence in the pouches. It was confirmed by comparing the staining with Orange G (Mallory's mixture) of sperms in the pouches with those in the vagina and by detecting sperm cells themselves under the oil immersion. Each pouch is lined inside by a thin cuticular intima. The epithelial cells are hardly visible, and have a thick layer of circular muscle coating. The entire organ is also superficially covered by circular muscles.

#### DISCUSSION

Good (1933) stated that the adult females of the genus *Tribolium* continue to lay fertilized eggs after a mating for nearly three months. They lay eggs on an average of 2-3 eggs per individual per day in favorable food medium (Mukerji & Sinha, 1953, in press). In view of this information regarding the biology of these beetles, the above described modifications of the spermatheca may provide for the storage of large numbers of sperms for day to day consumption. It seems possible that at the time of escape from the spermatophore, the sperms enter the spermatheca through the vagina, completely filling the pouches. As the pouches are convoluted and bound by muscular lining, they can easily accommodate a huge quantity of sperms which are released as the mature ova drop into the vagina one after another. Another possible explanation is that the anterior end of the vagina serves to contain many of the sperm cells under ordinary condition (figure 1b) and that the spermatheca provides only for long time storage or serves some other functions.

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